Oct. 8, 1963 L. J. RAUTIO 3,106,045

SWIMMING POOLS AND LIKE STRUCTURES OF THE TYPE HAVING ENDLESS PERIPHERAL METAL WALLS

Filed Jan. 14, 1959 2 Sheets-Sheet 1

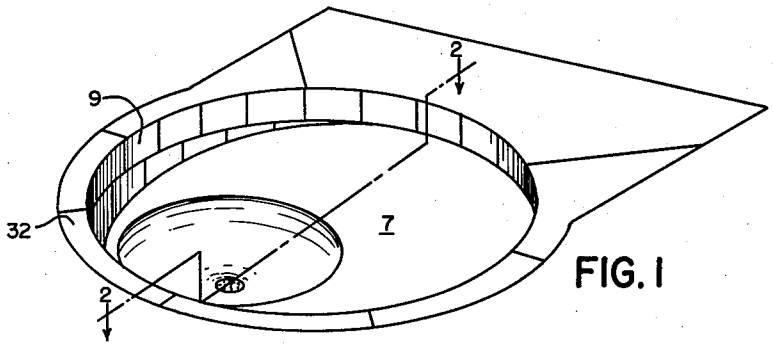


FIG. 1

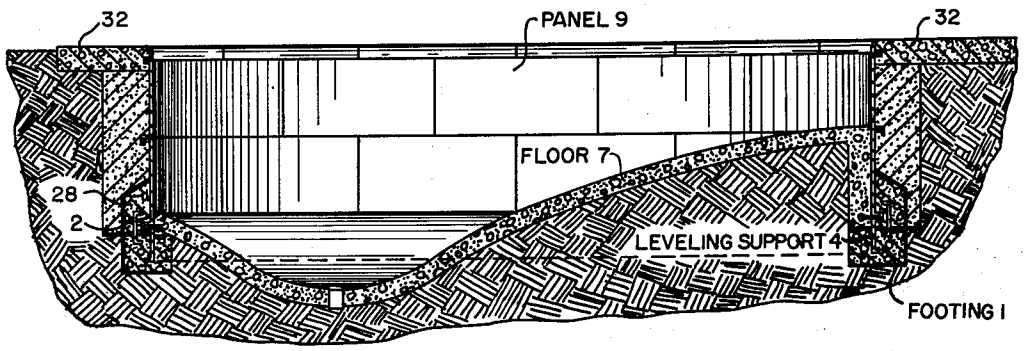


FIG. 2

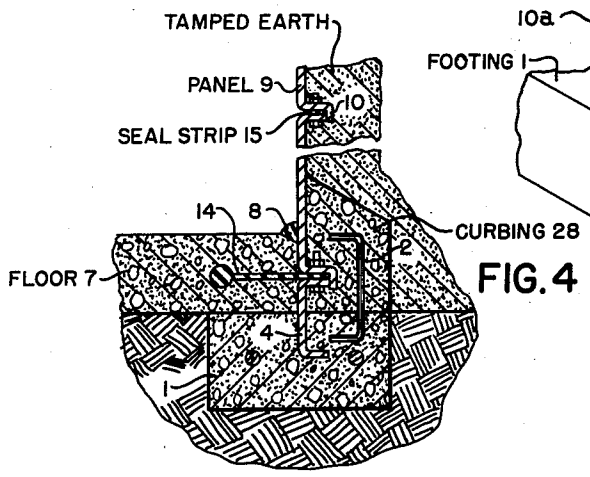


FIG. 4

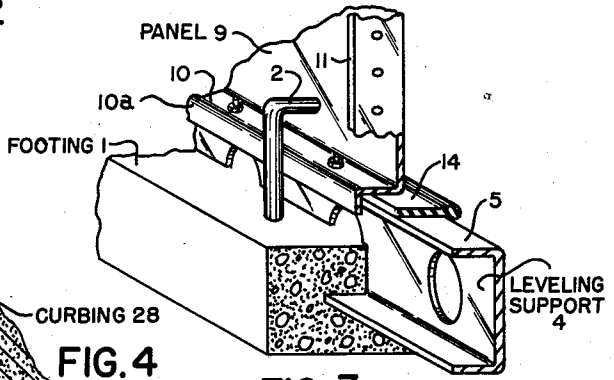


FIG. 3

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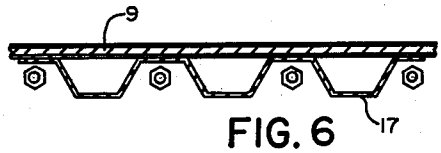


FIG. 6

FIG. 5

FIG. 7

FIG. 8

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SWIMMING POOLS AND LIKE STRUCTURES OF THE TYPE HAVING ENDLESS PERIPHERAL METAL WALLS

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This invention relates to swimming pools and like hollow structures of the type having an endless peripheral wall of predetermined contour in the horizontal direction. While the invention is generally useful in connection with stock watering pans, silos, grain bins and like structures, it is particularly suited for and primarily described in connection with swimming pools.

Swimming pools of the type having a peripheral wall composed of impervious metal-reinforced concrete, are extremely expensive to install. Those of the metal wall type are seldom, if ever, installed due possibly to the complications involved in shaping the metal walls to conform to the various pool shapes which are conventionally encountered today, such as kidney-shaped pools.

The principal object of this invention is to provide a metal pool or like construction which, in comparison with concrete pools, is relatively simple and inexpensive to install.

Another important object is to provide a metal swimming pool or like structure of a design such that it can be easily and quickly installed primarily with the use of unskilled labor.

Another important object is to provide a metal pool or like structure having a foundation of novel design which makes it possible to provide a level foundation in an easy and quick manner.

I have found that metal silo panels, which have heretofore been used primarily, if not exclusively, to make circular metal silos, circular grain bins and like structures, may be easily, quickly and inexpensively formed in the requisite circular and non-circular shapes required to conform to circular and non-circular peripheral wall contours, and that once the proper foundation is laid, such panels may be easily and quickly assembled to form the desired wall structure. I have also found that an accurately level footing can be easily and quickly installed simply by (*a*) shaping an elongate structural beam, grider or like member along its length to the horizontal contour desired in the peripheral wall, (*b*) suspending or otherwise, supporting this member at a desired elevation with its top surface accurately level and (*c*) pouring a concrete footing around the lower half of that member so as to embed that half and thereby firmly anchor the member in an accurately and permanently level condition.

Once this is done, it is a relatively simple matter to assemble and secure a succession of metal silo panels in row forming end-to-end relationship, with each panel shaped to conform to the contour of that portion of the peripheral wall it is intended to occupy. Naturally, it is equally easy to superpose one such row upon another to build the wall up to a desired height. My invention makes an advantageous use of silo panels in forming circular and non-circular shapes having endless peripheral walls for a variety of hollow structures ranging from the relatively short or shallow stock watering pans to the relatively tall silos and grain bins.

The invention is illustrated in the accompanying drawings wherein:

FIG. 1 is a perspective view of a swimming pool made in accordance with this invention;

FIG. 2 is a slightly enlarged vertical section taken generally along line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary perspective view of the bottom joint construction at the left of FIG. 2 but omitting the concrete other than that used in the footing;

FIG. 4 is an enlarged fragmentary vertical sectional view of the FIG. 3 joint when it is completed;

FIG. 5 is a perspective view of the reinforcing structure, which may be used along the outer side wall of some pool constructions;

FIG. 6 is an enlarged fragmentary horizontal section taken along line 6—6 of FIG. 5;

FIG. 7 is an enlarged fragmentary view showing the details of the joint between the upper end or mouth of the pool and the adjacent concrete sidewalk which encircles the mouth of the pool; and

FIG. 8 shows a slight variation of the FIG. 7 arrangement.

The swimming pool illustrated in the drawings is of the type having an endless peripheral wall of predetermined contour in the horizontal direction. Accordingly, while a circular wall is shown, it will be understood that it may be of oval shape, kidney shape or any of the other shapes commonly employed in swimming pool construction. Generally speaking, this pool comprises: a footing; a leveling support; a bottom wall; a peripheral wall; a structural reinforcement for the peripheral wall on the outer side thereof; a curbing on the outer side of the peripheral wall along its bottom; and a sidewalk on the outer side of the peripheral wall along its top.

Footing

A suitable excavation is conventionally made in the ground for a swimming pool constructed in accordance with this invention. This exacavation may be dug to provide a horizontally elongate ditch, having a contour in the horizontal direction which conforms to the horizontal contour of the proposed peripheral wall of the pool. This ditch should be wide enough to provide sufficient room on both sides of the peripheral wall to accommodate the specific construction used and the room required for its installation. The bottom of this ditch should be approximately level.

The concrete footing **1**, dimensioned say 12" wide x 8" deep, is laid in the ditch with its longitudinal vertical center more or less following the predetermined contour of the proposed pool wall. The footing **1** has vertical steel reinforcing rods **2** partially embedded in the footing to project upwardly therefrom at intervals throughout its length along the outer side of the proposed wall. These rods **2** are provided to reinforce the curbing which will encircle and abut the adjacent portion of the peripheral wall of the pool including the leveling support.

Leveling Support

The side walls of the pool are not carried directly on the upper surface of the footing **1**, as is done in conven-

tional pool constructions, but, in accordance with my invention, is carried on a horizontally elongate structural leveling support 4, which has a contour conforming horizontally to the predetermined contour of the periphery of the pool. This leveling support 4 is preferably composed of steel and fashioned in any suitable shape. As shown, it presents, in vertical cross-section, a web, also designated 4, which terminates in a horizontal or lateral flange 5 at its upper edge.

The leveling support 4 may be and preferably is composed of a series of channel-shaped structural steel members 4; hence, each has a horizontal flange along its lower edge and each is bent to the contour of that particular wall section which it will occupy. It is mounted on said footing by embedding its lower longitudinal half in said footing leaving its upper half to project upwardly therefrom.

It is desirable, in any structure and particularly in tall grain bins, silos and like structures, to have an absolutely level foundation upon which the vertical walls of the structure are supported. One important advantage of the leveling support 4 is that it provides an extremely easy means of rapidly securing a rigid and accurately level supporting surface for the side walls of the pool or other structure. It is also desirable, particularly in large stock watering pans, swimming pools and like structures, including some grain bins and silos, to have fluid tight joints in the peripheral wall and between such wall and the floor of the structure. Another important advantage of the leveling support 4 is that it provides joint lines which are easy to seal.

Bottom Wall of Pool

The bottom wall or floor 7 of the pool may have any desired surface contour. It may be of a porous or impervious nature. Preferably it is of an impervious nature because, if pervious, it would be highly desirable, if not absolutely necessary, to line the whole interior of the pool with an impervious plastic liner. Accordingly, the bottom wall 7 is conventionally constructed of steel reinforced impervious concrete and its surface is conventionally contoured. Also the joint line, between the floor and the peripheral wall of the pool, may be easily, quickly and conventionally sealed along the surface of the floor by any suitable caulking material 8. In this connection, it may be noted that the concrete floor normally is not poured until after the peripheral wall is partially or completely erected.

Peripheral Wall of Pool

The preferred embodiment of my pool structure includes a peripheral vertical-wall-forming assembly of peripherally flanged panels 9 horizontally arranged in end-to-end relationship to form a horizontal row, which is mounted on the upper end portion of the leveling support 4, each panel in the row being preformed to the horizontal contour required to make said row conform to said predetermined contour of the pool.

Each panel 9 may be composed of any heavy sheet metal, preferably steel. Thus good results have been obtained with panels composed of 12 gauge sheet steel dimensioned 2.5 feet in height x 6.0 feet in length. It is peripherally flanged outwardly, i.e., in a direction proceeding outwardly away from the pool interior; hence, has a horizontal bottom flange 10, a vertical flange 11 at each end and a horizontal top flange 12. Since all of the panel flanges extend outwardly, the inner or pool face of the peripheral wall ultimately formed by them is smooth.

Each panel is mounted upon the leveling support 4 by bolting the bottom panel flange 10 to the upper leveling support flange 5 at spaced intervals along the corresponding lengths of these flanges. In this connection, it will be noted that each bottom panel flange 10 is sufficiently wider than the top flange 5 of the web 4 (or top flanges 12 of the panels 9) to enable its outer end portion to be bent downwardly at 10*a* so that it will extend across the outer edge of the underlying flange. This is done to facilitate the assembly of the panels.

Where a truly circular pool construction is employed, the contour of all panels in the horizontal direction may be and preferably is in the form of identical arcs of that circle. With other shapes, the contour of each panel will depend upon its location in the row. Wherever it is to be located, it must be preformed to the horizontal contour which is required at that location to make said row conform to the predetermined contour of the pool.

Each panel in the bottom row is secured to the next adjacent panels by bolting their adjacent vertical end flanges 11 together. The drawing illustrates a second or top row of panels 9, which is supported on the aforesaid bottom row. The panels of the top row are secured to the bottom row and to each other following the identical practice employed in securing the panels of the bottom row. The bolt holes may be spaced 3" apart.

The joints in the peripheral wall of the pool may be sealed in any suitable manner. In the structure illustrated, a very effective seal is provided between the bottom row of panels 9 and the underlying flange 5 of the leveling support 4 by a resilient rubber-like sealing strip 14 which is wide enough to extend the full width of the joint and to project inwardly therefrom for a substantial distance approximating (or being slightly greater than) the width of the joint formed by the flanges 5 and 10. With this arrangement, it will be understood that the inwardly projecting portion of the sealing strip 14 is embedded in the floor concrete when the floor 7 is subsequently formed. In laying the floor concrete under and over the projecting portion of the strip, care is exercised to pack the concrete properly about the strip.

Sealing strips 15 of the same or equivalent composition are disposed between each vertical and horizontal joint formed by the end and top flanges 11 and 12 of the panels.

Before passing, it may be noted that, in the manufacture of silos, it is common practice to provide panels of the character herein shown with a porcelain enamel coating on their inner faces and the corresponding surfaces of all of their flanges. Following the same practice, any panels for any of the structures herein mentioned may likewise be provided with a porcelain enamel surface. The advantage of such a surface in stock watering pan and swimming pool construction is obvious.

Structural Reinforcement on Outer Side of Pool Wall

In swimming pool constructions using panels which have a radius of curvature ranging from 15 to 20 feet upwardly to infiinity, i.e., flat panels, it is desirable, and in some cases necessary, to strengthen that portion of the wall sufficiently to keep it from flexing or bending inwardly. To this end, the structural reinforcement shown in FIG. 5 on the outer side of a flat-faced peripheral wall, such as might be employed in some pool constructions, is provided.

Panels having a radius ranging from 15 feet upwardly to infinity may be reinforced by placing a corrugated steel sheet 17 over the outer face of each such panel and suitably securing it thereto. This sheet 17 may be provided with a horizontal or vertical succession of corrugations but, in any event, is preferably dimensioned to fit snugly within the peripheral flanges of the panel. It may itself be flanged for bolt securing purposes or otherwise secured in place. The use of this type of reinforcement is primarily intended to prevent the panels from flexing in the manner of an oil can diaphragm.

With panels having a radius of curvature ranging from 20 feet upwardly to infinity, the use of a stronger reinforcing structure is necessary. Thus, the one shown in FIG. 5 includes: a series of strong stake-like anchors 19 driven into the ground at spaced intervals along a line which extends parallel to the adjacent portion of the pool wall at a distance of 2½ to 6 feet from that wall; a struc-

turally strong bar or other member 20 extending between each stake and the adjacent upper portion of the peripheral wall of the pool, the inner end of this member 20 being rigidly connected through a gusset plate 21 to the top flange 12 of the adjacent upper row panel with its outer end adjustably connected through rod 22 and an adjusting nut to the top of the stake 19; and a downwardly inclined structural member 24 extending between the mid-portion of the horizontal bar 20 and the bottom flange 10 of the same upper row panel and being rigidly connected to both so as to cooperate with the horizontal bar 20 and the peripheral wall of the pool to form a fairly rigid truss. In other words, this type of reinforcement provides: a truss having two vertically spaced points of rigid connection with the wall and an apex spaced from the wall; and a ground anchor adjustably connected to the apex of that truss.

The anchored truss reinforcement above provided may be additionally strengthened by providing another structural member or brace 26 to incline downward between the horizontal bar 20 and the bottom flange 10 of the corresponding panel in the bottom row and by rigidly connecting it to both bar 20 and flange 10. Preferably this additional brace 26 is positioned to cross the downwardly inclined structural member 24 of the truss so as to cooperate therewith in forming an X whereby both may be rigidly connected together at the intersection of the X.

Outer Bottom Curbing

After the wall is erected and reinforced, where necessary, the peripheral wall is further reinforced by a concrete curbing 28 extending along its bottom on its outer side in position to embed the vertical reinforcing rods 2, which project upwardly from the footing, and the lower end of any additional truss member 26, which may be used. The use of the curbing 28 is desirable but not essential.

After the curbing has been laid and set, the space above it should be filled. With this construction, however, such space may be filled with tamped earth, a structurally strong filling material such as concrete being unnecessary.

Sidewalk

Before laying the sidewalk, an angle 30 may be bolted to the top flange 12 of the upper row of panels with a sealing strip 15 interposed therebetween. Where appearance is important, the angle 30 may be composed of stainless steel or composed of regular steel with a stainless steel cladding or wrapper 31 extending around it. With the angle in place, the sidewalk 32 may be installed.

The sidewalk 32 is conventionally made of reinforced concrete poured along the edge of the pool in slabs of suitable length, width and depth. Usually, these slabs are about 6 inches thick which is deep enough to embed the joint between angle 30 and the adjacent top flange 12 along with the horizontal bars 20 of the truss. They may be wide enough to embed the connections of the bar 20 with both inclined X members. Consequently, after the sidewalk sets or hardens, the bars 20 can be cut along the outer edge of the sidewalk and removed along with the anchors 19.

Scope of Invention

The leveling support 4 is, of course, normally provided in elongate sections of desired length and of predetermined contour. Preferably, they are of a relatively small size which makes them easy to handle and suitably flanged along top, bottom and end edges to make their joints easy to seal. Obviously, each leveling support section of this character is relatively easy to position and hold with its upper surface accurately level while the footing concrete is poured around its lower half. It will also be appreciated that the concrete pouring operation may proceed rapidly without paying much attention to the levelness of the top surface of the footing. When this footing concrete hardens, the leveling support provides an accurately level foundation which is highly desirable in shallow structures such as watering pans and swimming pools and absolutely essential in tall structures such as the tall silos. As a consequence, the leveling support feature of my invention is eminently suited too for use in a wide variety of structures.

Having described my invention, I claim:

1. An improvement in the construction of swimming pools, stock watering pans, silos, grain bins and like structures of the type having an endless peripheral wall of predetermined contour in the horizontal direction, comprising: a horizontally elongate masonry footing forming the bottom periphery of the structure; a horizontally elongate structural leveling support member conforming horizontally to said predetermined contour and presenting in cross-section a vertical web and a horizontal top flange, said structural member being mounted on said footing with the lower part of its web embedded in said footing leaving the upper part thereof projecting upwardly from said footing; a peripheral vertical-wall-forming assembly of peripherally flanged vertically arranged panels in horizontal end-to-end relationship to form a horizontal row, which is mounted on the top flange of said structural member, each panel being preshaped in the horizontal direction to the horizontal contour required to make said row conform to said predetermined contour; an elongate flexible sealing strip interposed between the horizontal top flange of said structural member and the adjacent bottom flange of said row of panels to extend longitudinally along the horizontal joint therebetween for sealing it and to project transversely inward from said joint for a substantial distance, means to secure the flanges of said joint together; and a masonry bottom located along the inner side of said wall to extend above said joint with the inwardly projecting portion of said sealing strip being embedded in said masonry bottom and sealing the joint between the wall and the masonry bottom.

2. The improvement of claim 1 wherein at least the lower portion of said wall is below ground level and soil is located to press against the outside of said wall, including: a plurality of corrugated sheets sandwiched between the outer side of said wall and the soil to reinforce the wall against the pressure of the soil.

3. A method of constructing swimming pools, stock watering pans, silos, grain bins and like structures of the type having an endless peripheral wall of predetermined contour in the horizontal direction, comprising: forming an upwardly opening footing trench conforming horizontally to said predetermined contour and having a bottom wall; providing an elongate structural leveling member conforming horizontally to said predetermined contour and having a vertical web in cross-section; temporarily supporting said leveling member in its final position in said trench with its top surface closely leveled to a horizontal plane with its bottom surface spaced upwardly from said trench bottom and with the footing space immediately below its bottom surface substantially empty of masonry footing material; thereafter pouring plastic masonry footing material into said trench to fill said empty footing space and to embed a substantial portion of said leveling member vertically to a desired extent reaching substantially above its bottom surface but terminating below its top surface and thereby permanently support said levelling member in its said final position; mounting, on the top of said leveling member, a peripheral vertical-wall-forming assembly of panels arranged in edge-to-edge relationship forming at least one horizontal row of panels conforming horizontally to said predetermined contour; clamping an elongate flexible sealing strip between the top of said leveling member and the bottom of said bottom row of panels to seal the joint therebetween and to extend horizontally along said joint and project

inwardly of it for a substantial distance; and pouring a masonry bottom along the inner side of the wall to extend above said joint and embed the projecting portion of said sealing strip in the masonry bottom to seal the joint between the wall and the masonry bottom.

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